TECHNOLOGIES ALERT

Commercial Application of Y-Branch Prefabricated Transition Joint for 275kV Cable System

Tokyo Electric Power Co., Ltd and J-Power Systems Corp. have developed Y-branch prefabricated transition Joint (hereafter called as YJB) for 275kV Cable System in order to utilized existing underground power cable line effectively. This YJB can be applied to both XLPE cable and SCFF cable.

By using the YJB, new 275kV cable system has been put into commercial use since 2007. In this project, nine sets of YJB for three circuits were installed. XLPE 2500mm^2 cable was installed to the single-mouth side and two SCFF cables were installed to the double-mouth side.

In the future, the increase of YJB applications for a replacement of aged existing equipment and other usage is expected.

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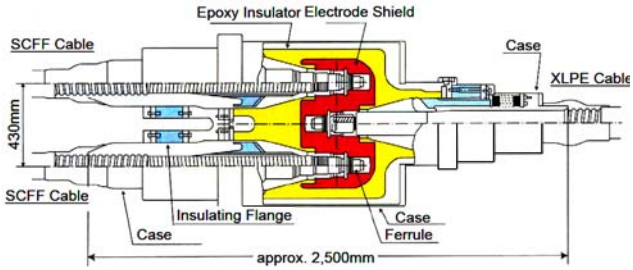
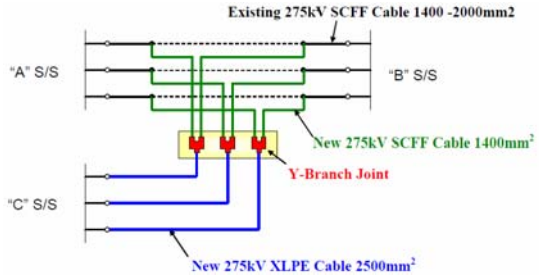


Installed 275kV YJB



Scheme of YJB applicable project

Development toward practical use of HTS cables for the earth in future

Superconductivity is an advanced technology for energy-saving and compact in electrical devices due to its properties of zero resistance and high current density. A high-Tc superconducting (HTS) wire is a electric wire that has superconductivity in liquid nitrogen temperature (-197℃). Particularly, we expect that coated conductors as typified by a YBCO wire will be applied for electrical power devices, because these will be achieved lowest cost and lowest loss in HTS wires in near future. The Furukawa electric have been developing the HTS cables that is one of the most promising applications and we have obtained brilliant successes such as the lowest AC loss cable, cable intermediate joint and so on.

However, it is difficult to put the HTS cables into a real power network because an infrastructure in an electrical utility needs very high reliability. Therefore, it is necessary to go clear problems of long term reliability and accident one by one. For example, we have successfully carried out a short circuit current test of 31.5kA 2second using a ten meter long HTS cable that was made from YBCO wires.

We develop HTS cables toward practical use in 2020 as important technology for the 'cool earth'.

Fig. YBCO HTS cable cut model and photograph of the short circuit current test. The test cable was constructed of a 10m YBCO HTS cable and a cable intermediate joint.

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Development of new cable accident point measuring instrument

The underground power cable is a high reliability supplying system, because equipment disaster cause by the thunder and wind are little. However, when the accident due to the cable damage occurs, the discovery of the accident part is difficult and the restoration time is long. Therefore, the method of measuring the accident point of the bridge method etc. is used. However, in recent years, it increased to construct a lot of lines in the same route. There are cases where the inducement voltage from the adjoining cable reaches up to 200V, and the measurement become difficult. Therefore, to solve this problem , the new underground power cable accident point measuring instrument that had a high measurement performance (The inducement voltage up to 300V is endured, Measurement accuracy ±0.5% or less) was developed.

The feature of this measuring instrument is a thing equipped with a multistep active filter to make the influence of the inducement voltage a minimum. As a result, it is expected that an early grasp of the accident part can be done.

Fig. New cable accident point measuring instrument

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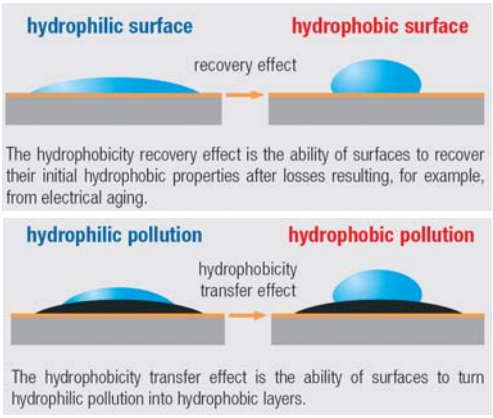
Araldite® HCEP & S-HCEP systems

(1) HCEP, Proven in extreme situations

HCEP systems have been developed to meet and exceed the stringent requirements of medium-to -high voltage outdoor applications. The durable hydrophobic outdoor epoxy systems offer high performance and reliability in severe climatic environments combined with the strength of traditional outdoor epoxy systems having about 40 years field performance history.

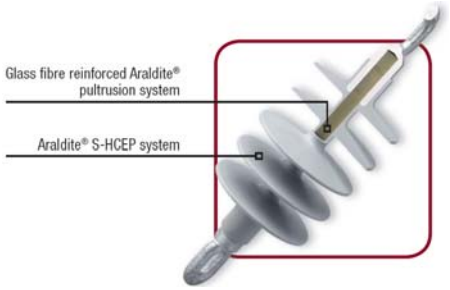
- Intrinsic hydrophobicity
- Hydrophobicity transfer effect
- Hydrophobicity recovery effect
- Long-term stability of hydrophobicity



(2) S-HCEP, Cost-efficiency in composite insulators

S-HCEP systems are new hydrophobic epoxy based semi-flexible shed materials for medium to high voltage outdoor insulation applications such as sheds of composite insulators and surge arrestors. They deliver intrinsic hydrophobicity, hydrophobicity transfer and recovery effects similar to the well-known HCEP systems and also provide excellent tracking and erosion resistance and good water diffusion break down strength. Insulators made from S-HCEP systems have passed the 1000 hours salt fog test according to IEC 61109 (FGH Mannheim, Germany).

- Mixing ratio of 1:1 by volume which makes it suitable for the same meter mix equipment as used for LSR
- No vacuum preparation, no pre-mixing and no heating necessary
- Lower material cost than that of silicone (LSR)
- Better adhesion of sheds to the composite rod
  = No primer treatment needed to composite rod
- Lower viscosities = lower filling times
- Moderate reactivity = no mold cooling
- No post-cure necessary



Reference : AdMat_Araldite HCEP/S-HCEP_03/08_en

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The World Most Outstanding and Advanced Technology Adopted In CHINA UHV FIELD

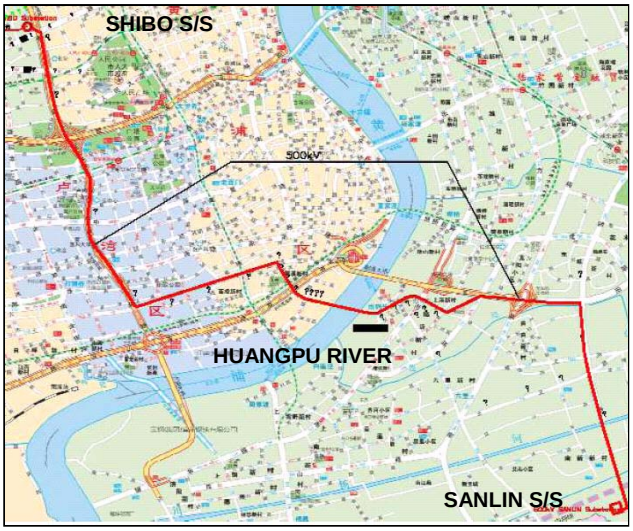
(1) SHANGHAI EXPOPOSITION 500kV XLPE CABLE TRANSMISSION LINE

As the completion of XLPE cable technology, the world first and longest 500kV XLPE cable transmission line (TEPCO Sin-Toyosu line in Japan) has been realized in 2000.

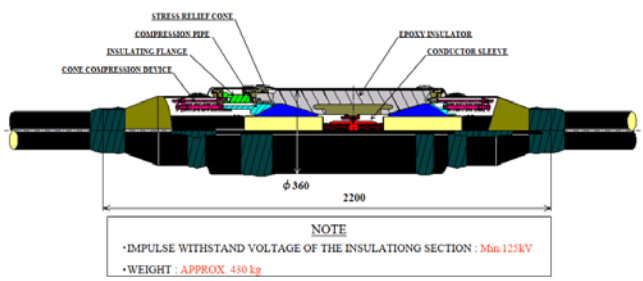
This technology and world first 500kV prefabricated joints (which was also developed in Japan) are now applied to supply major power for the site of SHANGHAI EXPOSITION 2010 and will be energized in late 2009.

We, VISCAS Corporation Japan is honored to supply & erect about 52km of 500kV XLPE/ Al.Corrugated/FRPVC Cable 2500mm^2 and 78 sets of Prefabricated joint which is the world **first** experience to be installed in the Shanghai Huangpu River crossing Tunnel constructed by Shanghai Municipal Power Co.

The Cable system was long-term (IEC62067, prequalification) tested at Wuhan Testing Institute with satisfactory results and also type tested at our own laboratory.



500kV SHIBO CIRCUIT ROUTE LAYOUT

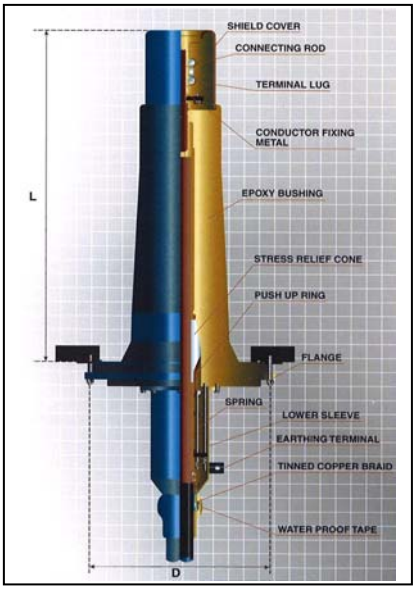


500kV PREFABRICATED JOINT

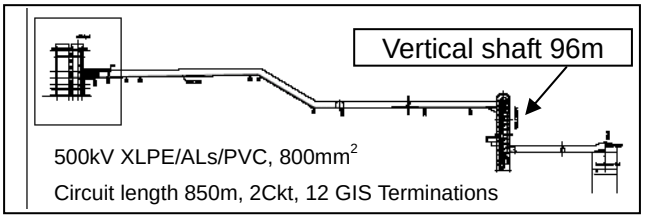
(2) THE WORLD FIRST 500kV DRY TYPE GIS TERMINATION ENERGIZED IN CHINA

After years of continuous effort, research & development, the world **first** perfectly DRY type GIS termination were completed and energized on July 2008 at XILONGCHI Pumped Storage Power Station, SHANXI, CHINA. On successful completion of the above projects, a few new projects with same DRY type of GIS termination are now under construction. The main characteristics of the termination are as follows;

- ✓ Perfectly DRY, does not require Oil or GAS
- ✓ Positioning of DRY GIS termination in reverse, horizontal or tilt
- ✓ Environmental Friendly (no leaking of Gas or oil) & Maintenance Free



World first 500kV DRY-type GIS Termination



XILONGCHI 500kV Pumped Storage S/S Layout

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Improving Epoxy-based Insulating Materials with Nano-fillers toward Practical Application

(1) Motivation for Development of Environmental-conscious Heavy Electric Apparatus

Nanocomposites offer exciting new possibilities for dielectric and insulating materials, and practical application has been a primary concern in recent research. We have focused on nanocomposite insulating materials as a way to realize environment-conscious switchgears without sulfur hexafluroride (SF_6) insulating gas, which was designated as a greenhouse gas in the Kyoto protocol on global warming. SF_6 gas emissions into the atmosphere are strictly controlled at present, although reduction of its gas use is an important issue. Solid insulation systems using nanocomposite materials are an effective approach to reducing the use of SF_6 gas (Figure 1).

(2) Nano- and Micro-filler Combination Enabling Practical Use of Nanocomposites

Our R&D demonstrates that nano-filler dispersion is effective in improving insulation properties of epoxy-based insulating materials. Moreover, nano- and micro-filler combination is adopted as an approach toward practical application of nanocomposite insulating materials (Figure 2). The nano- and micro-filler mixed composite (NMMC) has the same low thermal expansion as metal conductor (aluminum), and insulation breakdown properties superior to those of conventional insulating materials. Consequently, an aluminum conductor and a vacuum interrupter were molded by the nano- and micro-filler mixed composites for the first time in nanocomposite research (Figure 3). Our next work will be to evaluate the NMMC in full-scale trial models.

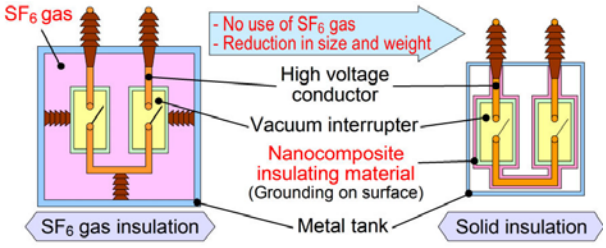

Figure 1. Environment-conscious switchgears by solid insulation system

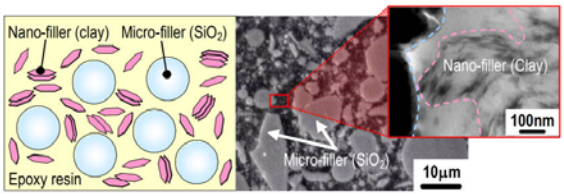

Figure 2. Nano- and micro-filler mixed composite (NMMC)

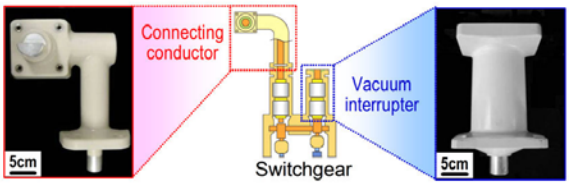

Figure 3. Full-scale trial models molded from NMMC

Toshiba Corporation, Kansai University (Prof. Ochi) and Waseda University (Prof. Ohki and Prof. Tanaka) conduct this collaborated R&D project supported by New Energy and Industrial Technology Development Organization (NEDO).

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